On How (Not) To Uncover Cross-Linguistic Variation[*]

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1. Introduction

According to Evans and Levinson (2009; henceforth E&L), typological research reveals that Universal Grammar is a myth. E&L's main assertions can be summarized as in (1).

(1)

Empirical:	Language diversity is greater than generative grammarians expect or know about.
Analytical:	Language diversity is greater than can be explained by Universal Grammar (UG).
Methodological:	It is typological research which reveals the striking range of linguistic diversity.

The goal of this paper is to argue against all three of E&L's assertions. My proposals are summarized in (2).

(2)

Empirical:	Cross-linguistic formal research has led to the discovery of much diversity in language.
Analytical:	Language diversity is not inconsistent with UG.
Methodological:	Language diversity is accurately discovered only by in-depth, possibly partially abstract, analyses of individual languages.

I will argue for the proposals in (2) specifically with respect to semantics, and even more specifically with respect to a case study on the semantics of modality. My areal focus is languages of the Pacific Northwest of North America. Within these realms I will compare the results achieved by cross-linguistic work based on formal research, with those of typological work not based on formal research. I will argue that while the former reveals

[*] Many thanks to St'át'imcets consultants C. Alexander, G. Ned, L. Thevarge, the late B. Frank and the late R.A. Whitley, and Gitxsan consultants B. Sennott and V. Gogag. For helpful comments, thanks to H. Davis, audiences at UBC and NELS 42, and the UBC modality seminar (S. Chen, J. Glougie, B. Laturnus, P. Littell, T. Liu, M. Louie, A. Reis Silva, H. Rullmann, O. Simchen and C. Turner). Research was funded by SSHRC grants #410-2007-1046 and #410-2011-0431 and the Jacobs Research Fund.

interesting differences as well as important similarities across languages, the latter can lead to misanalysis, unsubstantiated claims, and spurious generalizations.

The structure of the paper is as follows. Section 2 addresses E&L's claim that linguistic diversity is greater than formal linguists are aware of; I give examples of semantic diversity uncovered by formal linguists. Section 3 addresses the analytical claim that linguistic diversity is incompatible with UG; I address some misconceptions about UG, and outline conspicuous similarities found across languages. In section 4 I reject the methodological claim that descriptively-based typology is the best way to uncover variation. Using the case study of modality, I show that an E&L-style methodology leads to inaccurate results. Section 5 concludes by presenting the methodology I advocate, which combines both in-depth formal study, and typological research methods.

In the remainder of the introduction I define some relevant terms. *Formal* research is research which uses the scientific method: it makes testable hypotheses, tests the predictions against data, and revises the hypotheses accordingly. It does not necessarily involve an assumption of UG. *Typology* is a methodology which looks at phenomena in a wide range of languages, with the goal of extracting generalizations and uncovering regularities. Typology is also not intrinsically linked to a particular theoretical approach. Thus, there is no necessary dichotomy between formal research and typology, or between UG-based research and typology. Uncovering linguistic diversity is at least as important for a generative grammarian as it is for someone who rejects the generative enterprise. Therefore, formal research and typology can (and should) be fruitfully combined.

2. Empirical Issues: Semantic Diversity Uncovered by Formal Linguists

In this section I address E&L's empirical claim that language diversity is greater than generative grammarians expect or know about. I summarize the results of recent cross-linguistic formal semantic research in a range of areas, and show that it has led to the discovery of much semantic diversity across languages.

One example of semantic diversity uncovered by formal linguists concerns **determiners**, which encode different semantic distinctions in different languages. For example, Salish languages differ from many Indo-European ones in not encoding definiteness (Matthewson 1998, 1999, Gillon 2006, Lyon 2011). Although Salish languages possess complex determiner paradigms encoding deictic, number and gender distinctions, there is never a distinction between referents which are familiar to both interlocutors, and those which are not. This is illustrated for Sḵwx̱wú7mesh in (3), from Gillon (2006:84). We see that the same determiner *ta* is used both for introduction of a novel bear, and coreference with a familiar bear.

(3) Chen-t wa í-7imesh. Chen kw'ách-nexw *ta* míxalh.
1SG.S-PST IMPF REDUP-walk 1SG.S look-TR(LC) *DET* bear
'I was walking. I saw a bear.' (DISCOURSE-NEW)

Ta míxalh na mi ch'i-ch'áy-s-t-ts-as.
DET bear RL come REDUP-follow-CAUS-TR-1SG.O-3ERG
'The bear followed me.' (DISCOURSE-OLD)

Cross-linguistic differences in determiner semantics are often uncovered only through formal investigation; descriptive resources which mention determiners are often mistaken

about the presence of a definiteness distinction. For example, Dryer (2011) incorrectly classifies Sḵwx̱wú7mesh as a language which possesses a definite determiner; he bases this claim on Kuipers' (1967) grammar of the language.

There is also substantial variation in the semantics of **quantifiers** across languages. Davis (2010) shows that St'át'imcets (Salish) lacks generalized quantifiers (see also Jelinek 1995 on Straits). Quantifiers in St'át'imcets give rise only to cumulative readings, and lack readings where one quantifier scopes over another. Consider the sentence in (4).

(4) *Context: Four children are meant to read four books over the summer holidays.*
tákem i=sk'úk'wmi7t=a paqwal'ikst-mín-itas *sáq'ulh* i=púkw=a
all PL.DET=child(PL)=EXIS read-RED-3PL.ERG *half* PL.DET=book=EXIS
'All the children read half the books.'

There are two potential scopal readings for (4). If the subject takes wide scope, each child read half of the books (a potentially different two books for each child). If the direct object takes wide scope, then for one set of two books, say books 1 and 2, all of the children read those books. Davis tested the acceptability of (4) in contexts supporting each of these readings. (5) is a context which supports the subject-wide-scope reading:

(5)

A reads	B reads	C reads	D reads
books 1,2	books 2,3	books 3,4	books 1,4

However, St'át'imcets speakers reject (4) in the scenario in (5), indicating that a subject-wide-scope reading is not available. The inverse scope reading also is not available. (6) is a context where the object-wide-scope reading is true: for half of the books (books 1 and 2), all the children read them. St'át'imcets speakers reject (4) in context (6).

(6)

A reads	B reads	C reads	D reads
books 1,2,3	books 1,2,4	books 1,2,3,4	books 1,2

According to Davis (2010), (4) is acceptable if and only if all the children were involved in reading, and a total of two books were read. This is a cumulative reading. The presence of *only* cumulative readings in St'át'imcets is a striking difference from languages like English. Differences like this can only be uncovered by targeted elicitation, guided by a formal hypothesis about expected readings.

With respect to **tense**, it is well-known that many languages do not obligatorily overtly encode tense distinctions. Formal research has however gone further to reveal marked diversity in the temporal interpretation of bare predicates in superficially tenseless languages. For example, in some languages, a bare predicate can be interpreted as past, present or future (e.g., Okanagan; Dunham 2011); in others, a bare predicate can never have a future interpretation (e.g., St'át'imcets; Matthewson 2006b). Even closely related languages can differ on subtle points, such as whether activity predicates are by default interpreted as present or past. See Bohnemeyer (2002, 2009), Bittner (2005), Lin (2006), Reis Silva & Matthewson (2007), Tonhauser (2011), among others.

With respect to **aspect**, formal semantic investigation has shown that languages vary in the semantics of their lexical aspectual classes, and of their viewpoint aspects. To give just one example, many languages differ from English in that their accomplishment

predicates ('build a house', 'fix the fence') do not require the event to culminate, even in the perfective aspect. Bar-el (2005) shows this for Sḵwx̱wú7mesh; see Kiyota (2008), Turner (2011) for other Salish languages, and many other researchers for other families.

Turning to **modals**, formal cross-linguistic research has revealed that languages may or may not distinguish necessity from possibility, and may or may not lexically encode the type of modality (epistemic vs. deontic, etc.; see Rullmann et al. 2008, Peterson 2010, Deal 2011, among others). Typologists working with descriptive sources have also noticed this variation; see section 4 below for a critique of their proposals.

Evidentials are another area of significant linguistic diversity. Recent formal work has shown that evidentials in different languages encode subtly different distinctions, and – something not noticed by non-formal sources – differ with respect to whether they introduce propositional modal content. Thus, some evidentials are semantically similar to English epistemic modals, while others are argued to operate only at the speech-act level. See Izvorski (1997), Faller (2002, 2011), McCready & Ogata (2007), Matthewson et al. (2007), Peterson (2010), Lee (2011), Murray (2011), among others, for discussion.

Formal research on **degrees** and **comparatives** has begun to reveal significant differences across languages. For example, Kennedy (2007), Beck et al. (2009), and Bochnak (2011), among others, argue that languages vary in whether they compare individuals or degrees, or in whether adjectives even introduce degree arguments. These analytical claims are based on subtle empirical differences, such as whether the language possesses a 'difference comparative' construction ('Bob is one meter taller than Tim').

Another example of linguistic diversity uncovered by formal semantic research concerns **presuppositions**. Matthewson (2006a, 2009) argues that St'át'imcets lacks presuppositions of the English type, which require information to be in the common ground at the time of utterance. The proposal that some languages lack presuppositions is a radical claim about variation, and it is a finding we could not have made using typological methods based on descriptive sources. This kind of discovery requires detailed primary fieldwork targeted specifically to the question of presupposition.

Summarizing this section, we have seen that in many, if not all, areas of semantics, formal research has uncovered interesting diversity. E&L's first claim – that formal linguists are not interested in diversity and are unable to discover it – is false.

3. Analytical Issues: Language Diversity Is Not Inconsistent With UG

Recall E&L's second claim: that language diversity is greater than can be explained by UG. In this section I argue that language diversity is not inconsistent with UG.

It is important at the outset to clarify that UG cannot be (dis)proven on the basis of surface data alone. In other words, it is insufficient, as an argument against UG, merely to present some fact about linguistic diversity. This is because UG is an abstract construct, not surface-visible, and not defining any particular grammar. Testing UG requires a certain level of theoretical sophistication, and a willingness to entertain abstract analyses.

The fact that UG is not falsifiable merely on the basis of surface data does not mean that it is empirically unfalsifiable, as E&L state at several points.[1] E&L suffer from two confusions with respect to the falsifiability of UG. The first is a misunderstanding of

[1] Interestingly, E&G argue both that UG is falsified by the attested range of linguistic diversity (e.g., p. 439), and that it is unfalsifiable (e.g., p. 436).

what UG is: they wrongly assume that UG entails that 'all languages share the same structure at some abstract level' (E&L:430). UG does not require that all languages share the same structure. The claim is rather that human infants are genetically endowed with certain limits on the range of possible languages, and this endowment enables language acquisition to take place. As UG is not surface-visible, it is difficult to determine empirically what its properties are, but any theory of UG does make empirical predictions about possible and impossible human languages. As a result, claims about UG are frequently altered on the basis of new data. This very fact leads to E&L's second confusion. They imply that UG is an unfalsifiable moving target, by listing a series of changes in the theory in response to new data (E&L:436-37). However, this is simply the scientific method in action. New data *will* sometimes result in having to revise our notions of UG. But this is a virtue of an explicit hypothesis which makes predictions.

Turning specifically to the semantic component of UG, there are so far very few well-supported semantic universals, in part because cross-linguistic research is much newer in semantics than in other subfields (see von Fintel & Matthewson 2008 for an overview). Most semanticists assume some formal universal constraints, such as compositionality, and a small number of universal composition principles. Substantive constraints on denotations have also been proposed (such as conservativity; Barwise & Cooper 1981). There is *restricted* variation in the inventory and lexical semantics of functional morphemes. My belief is that semantic variation is usually non-parametric, and often consists of differences in how languages lexically divide up the same semantic space. Languages seem to choose from among the same core building blocks of meaning, but research is just beginning on what those universal building blocks might be.

For obvious reasons – including the lack of sufficient knowledge about semantics in the world's languages – it is impossible to prove here that the range of semantic variation in human languages is compatible with UG. Instead I will present, as a proof of concept, some examples of semantic uniformity which have been uncovered by formal linguists. Uniformity across unrelated language families is an indication that variation is not random or without limit, and this is something which UG is prima facie better-equipped to handle than a radical variationist model such as that adopted by E&L.

Recall from above that determiners vary in their semantics cross-linguistically. However, there are also striking similarities. For example, languages as unrelated as English, Inuktitut, St'át'imcets and Akan (Kwa) have been argued to use the same choice function mechanisms (Kratzer 1998, Matthewson 1999, Wharram 2003, Arkoh 2011). These claims are based on subtle empirical contrasts such as those in (7-8). In both English and St'át'imcets (as well as other languages), the presence of a bound variable pronoun licenses a narrower-than-widest scope reading which would not otherwise have been available. Thus, (7a) and (8a) only allow interpretations where there is one specific student, who every teacher will be sad about, while (7b) and (8b), containing a bound variable pronoun, allow interpretations where each teacher will be sad about one of their own students. (7a,b) are adapted from Ruys (1992).

(7) a. Every teacher will be sad if *a student of mine* cheats on the exam.
b. Every teacher will be sad if *a student of his* cheats on the exam.

(8) a.

tákem	i=wa7	tsunám'-cal	cuz'	wa7	qwenúxw-alhts'a7
all	DET.PL=IMPF	teach-ACT	PROSP	IMPF	sick-inside

lh=káw-lec=as *ta=twíw't=a*
HYP=far-ACT=3SBJN *DET=child=EXIS*
'Every teacher will be sad if a child quits.' (Matthewson 1999:119)

b. tákem i=wa7 tsunám'-cal cuz' wa7 qwenúxw-alhts'a7
all DET.PL=IMPF teach-ACT PROSP IMPF sick-inside
lh=káw-lec=as *ta=twíw't=a* *ti=wa7* *núk'w7-an-as*
HYP=far-ACT=3SBJN *DET=child-EXIS* *DET=IMPF* *help-DIR-3ERG*
'Every teacher will be sad if a child s/he helped quits.'(Matthewson 1999:120)

This parallelism of interpretive facts across languages is easily explained if the choice function mechanism proposed for English by Kratzer (1998) is available as part of UG. A radical variationist approach is obliged to account for these data in some other way.[2]

In terms of tense, although languages vary in the interpretations of temporally unmarked predicates, there are also significant cross-linguistic parallels. For example, Matthewson (2006b) shows that in St'át'imcets, future marking in a matrix clause induces obligatory forward-shifting of an embedded clause reference time, while a matrix clause with a past reference time allows a simultaneous reading for the embedded clause. The interpretive pattern is exactly the same as in English (e.g., Enç 1996, Abusch 1998).

With respect to evidentials, in spite of the variation discussed above, closer inspection also reveals important similarities, as well as strict restrictions on what a possible evidential can encode. Speas (2004) points out that the evidential space is much smaller than would be predicted by general rules of inference. And some researchers have argued that even supposedly non-modal evidentials are analyzable as epistemic modals very similar to those of languages like English. Conversely, English modals are found to have evidential properties (von Fintel & Gillies 2010, Matthewson 2012, among others).

Finally, even in the case of languages which lack English-style presuppositions, we can see a very restricted system at work. Simons et al. (2011) distinguish between two types of 'not-at-issue' content (content which is not the main point of the utterance; see also Potts 2005). Some not-at-issue content does not need to be in the common ground at the time of utterance (e.g., English appositive relative clauses), and some such content does need to be in the common ground (e.g., English presuppositions). St'át'imcets is a language which lacks one sub-kind: it has only non-presuppositional not-at-issue content. Languages simply choose different subsets of the same restricted range of meaning types.

Although space prevents further illustration here, it seems that in virtually all areas of semantics, languages encode essentially similar building blocks of meaning and/or choose from the same small range of options. Differences are typically differences in how languages lexically divide up the available semantic space. In spite of semantic variation, therefore, there is no evidence falsifying UG.

4. Methodological Issues: Diversity is Best Uncovered by Formal Research

In this section I address E&L's assertion that it is typological research which reveals the striking range of linguistic diversity. As noted above, there is no necessary dichotomy

[2] Although E&L claim that similarities across languages are due to 'cultural-historical factors and the constraints of human cognition' (p. 429), they do not give any specific accounts of how attested uniformity is derived from these constraints.

between formal and typological research. In practice, however, they are often pursued separately. I will argue against *purely descriptive* typological research, by comparing the results obtained via this methodology, with results obtained by research done in a formal tradition. We will see that an E&L-style methodology often leads to inaccurate results.

Let us begin with a quick examination of what E&L say about the Salish language family. Everything E&L say about Salish is false. For example, they state (E&L:434) that 'A feeling for what a language without a noun-verb distinction is like comes from Straits Salish ... The single open syntactic class of predicate includes words for events, entities, and qualities.' E&L cite Jelinek (1995) for this claim, but fail to cite any of the huge body of research demonstrating category distinctions in Salish, or the strong current consensus in the Salish literature that categories exist. For arguments that Salish possesses category distinctions, see Hébert (1983), Hukari (1983), van Eijk & Hess (1986), Demirdache & Matthewson (1995), Beck (1995, 1999a,b, to appear), Mattina (1996), Davis et al. (1997), Haag (1998), Davis (2002, 2003), Davis & Matthewson (1999, 2009), Kinkade (2000), Montler (2003), Galloway et al. (2004), Weichel (2004), Wiltschko (2005), a.o.[3]

Why does it matter that E&L are wrong about Salish? Because E&L's argument against UG is primarily empirical: they claim that the attested diversity in language cannot be explained by UG. If the putative diversity they cite does not exist, the argument falls apart. Furthermore, E&L's mistakes about Salish are not isolated instances; they are partly an almost inevitable result of their methodology. The reason for this is that typological studies are, of necessity, only as good as the individual analyses they are based on. I will argue that at least when it comes to semantics, the individual analyses are never good enough unless they have employed formal tools to undertake a sustained, in-depth investigation. I will demonstrate this based on a case study involving modality.

4.1 Case Study: Modality

4.1.1 Formal Research Results

In this section I show that in the realm of modality, formal research methods result in interesting proposals about linguistic diversity. Before beginning, we need a basic semantics for modals; I adopt the standard analysis of Kratzer (1991). Modals introduce quantification over possible worlds. The set of worlds quantified over is narrowed down by 'conversational backgrounds', which give us different 'types' of modality (epistemic, deontic, and so on). In English, the conversational backgrounds are usually provided by context, rather than lexically encoded. This is shown in (9), where we see that depending on the context, the modal auxiliary *must* can be interpreted epistemically or deontically.

(9) a. Maria *must* be in her office (given that her door is open). EPISTEMIC
b. Maria *must* be in her office (from 9 to 5; she is the receptionist). DEONTIC

(9a) asserts that in all worlds compatible with the speaker's knowledge, and in which things happen in a stereotypical fashion, Maria is in her office. (9b) asserts that in all worlds in which Maria satisfies her actual-world job description, she is in her office.

Although English modals typically leave conversational background up to context,

[3] E&L are also apparently confused about language families; they refer at one point to 'the Wakashan language Straits Salish' (E&L:481).

they lexically encode modal force (the strength of the quantification). Thus, (10a) involves quantification over *all* relevant worlds (a necessity modal), but (10b) involves quantification over *some* relevant worlds (a possibility modal).

(10) a. She *must* be in her office. EPISTEMIC OR DEONTIC NECESSITY ONLY
b. She *may* be in her office. EPISTEMIC OR DEONTIC POSSIBLITY ONLY

Now we turn to cross-linguistic research. One interesting finding is that languages vary in what they lexically encode. For example, St'át'imcets displays the reverse lexicalization pattern to English: St'át'imcets modals lexically encode conversational background, but leave modal force up to context (Matthewson et al. 2007, Rullmann et al. 2008, Davis et al. 2009). This is illustrated in (11-12). (11) contains the modal *k'a;* this modal is felicitous in epistemic contexts, and unacceptable in non-epistemic discourse contexts. *K'a* does not distinguish modal force; it is offered and accepted in situations corresponding to epistemic necessity or epistemic possibility.

(11) wá7=*k'a* s-t'al l=ti=tsítcw-s=a s=Philomena
be=*EPIS* STAT-stop in=DET=house-3SG.POSS=EXIS NOM=Philomena
'Philomena must / might be in her house.'

(12) contains a different modal *ka.* This modal is unacceptable in epistemic contexts, but felicitous in deontic ones. Like *k'a* (and all other St'át'imcets modals), it is not restricted to either necessity or possibility, but is felicitous in contexts corresponding to any kind of modal force. See the references cited above for more supporting data, and analysis.

(12) lán=lhkacw=*ka* áts'x-en ti=kwtámts-sw=a
already=2SG.SUBJ=*DEON* see-DIR DET=husband-2SG.POSS=EXIS
'You must / can / may see your husband now.'

This type of modality research has been carried out in several other languages, so we can begin to create a formal typology. We have already seen that English and St'át'imcets encode different aspects of modal semantics (roughly speaking, either the modal force or the modality type). In some languages, modals encode both modal force *and* type of modality; examples include Javanese (Vander Klok 2008) and Blackfoot (Reis Silva 2009). These results are summarized in table form in (13-15).

(13)

English	NECESS.	POSSIB.
DEONTIC	*must*	*may*
EPISTEMIC		

St'át'imcets	NECESS.	POSSIB.
DEONTIC	*ka*	
EPISTEMIC	*k'a*	

Javanese	NECESS.	POSSIB.
DEONTIC	*kudu*	*ento, olèh*
EPISTEMIC	*mesthi*	*mungkin*

Some systems mix-and-match, encoding a necessity/possibility distinction only for certain modality types, or they make finer-grained distinctions, encoding sub-types of conversational background. An example of a mixed system is Gitxsan (Tsimshianic).

Gitxsan encodes modal force only for non-epistemics (circumstantials), and it makes sub-distinctions within both the circumstantial and the epistemic domains (Peterson 2010, Matthewson in press c). This is shown in (14).

(14)

		POSSIBILITY	(WEAK) NECESSITY
CIRCUMSTANTIAL	PLAIN	*da'ak(hl)xw*	*sgi*
	DEONTIC	*anook*	
EPISTEMIC	PLAIN	*ima('a)*	
	REPORTATIVE	*gat*	

Rullmann et al. (2008) propose that the variation in modal systems is largely a matter of where languages choose to make the lexical divisions. In general, the same semantic space is covered: all languages seem to have ways to express epistemic possibility, epistemic necessity, circumstantial possibility and circumstantial necessity. These observations, if correct, could be developed into a substantive universal.

However, this is not the end of the story. There are indications that cross-linguistic variation in modals may *not* be purely a matter of lexical division. For example, Peterson (2010) argues that Rullmann et al.'s analysis of the St'át'imcets variable-force modals does not extend to the Gitxsan ones. He argues that variable-force modals can be either necessity modals which allow weakening (as in Rullmann et al.'s analysis of St'át'imcets), or possibility modals which allow strengthening (as in Peterson's analysis of the Gitxsan epistemic modal *=ima)*. The different analyses make the same empirical predictions in terms of coverage of the semantic space, but correctly predict different default readings for modals in the two languages.

And then there is Deal (2011), who argues that the Nez Perce modal system differs in its expressive force from that of English. Nez Perce possesses a single non-epistemic modal *o'qa,* which Deal argues is semantically a possibility modal. Usually, *o'qa* is felicitous also in necessity contexts, because existential quantificational statements are true in universal contexts (if it is true that I *have to* clean my room, it must also be true that I am *allowed to* clean my room). However, in downward entailing contexts (e.g. under negation), a possibility modal is not predicted to be usable in either possibility or necessity contexts (if I *don't have to* clean my room, it does not follow that I am *not allowed to* clean my room). Deal shows that when *o'qa* is negated, Nez Perce speakers construe the sentences only as making a negated possibility claim. This is shown in (15).

(15) *Context: you are explaining to someone who thinks they have to leave that they are not in fact required to do so. It's not necessary for them to leave.*

\# weet'u 'ee kiy-*o'qa*
not you go-*MODAL*
Consultant: "That's a different conversation, not this one. You're just saying *weet'u 'ee kiyo'qa,* 'You can't go.'" (Deal 2011:574)

On the basis of data such as (15), Deal argues that Nez Perce speakers have no way to express an unambiguous necessity claim. They must resort to paraphrases and inference. Deal thus sheds doubt on the idea that all concepts expressible in one language are translatable into any other language, as well as on a strong version of *effability* (the idea

that every proposition can be expressed in any language; see Keenan 1974, Katz 1976).[4]

It is important to realize that the potential failure of strong effability revealed by Deal's work (cf. also von Fintel & Matthewson 2008) does not pose any problem for UG. This is because UG does not (and could not) specify a set of propositions which all languages must be able to express with ease. In semantics, UG is more likely to constrain formal properties, like composition principles (see section 3 above). However, Deal's cross-linguistic formal semantic research sheds interesting light on the question of which meanings languages can do without. We would never have detected the effability issue in Nez Perce without a formal analysis based on targeted fieldwork.

Cross-linguistic formal research on modality has further consequences for our understanding of modal semantics in human language. For example, the Gitxsan system presented in (14) above provides empirical support for the standard binary division between epistemic and circumstantial modality (unlike e.g., a three-way primitive distinction between modality types, as argued for by Portner 2009). Another case where Gitxsan sheds light on theoretical debates comes from modality-tense interactions. Modals are often future-oriented, as illustrated in (16); the time of the possible/necessary event follows the time at which the worlds being quantified over are calculated (Condoravdi 2002, among many others).

(16) a. You *must* do fifty push-ups.
Utterance Time < time of your push-ups (Enç 1996:349)

b. Sally *may* go to the party if she finishes her work.
Utterance Time < time of Sally's going to the party (Enç 1996:349)

There is a debate about the source of future-orientation in modals. It has variously been argued that the futurity is (i) *lexical* (encoded in the lexical entry of the modal itself; Enç 1996, Condoravdi 2002, Abusch 2008, Demirdache & Uribe-Etxebarria 2008, Van de Vate 2011, a.o.), (ii) due to *general mechanisms* (to do with the structure of branching worlds; Condoravdi 2002, Werner 2006, Copley 2006, a.o.), (iii) influenced by the *Aktionsart / lexical aspect* of the clause under the modal (Zagona 1990, Condoravdi 2002, Laca 2008, a.o.), or (iv) a result of *viewpoint aspect* (a silent prospective aspect which provides the futurity; Kratzer 2011, Matthewson in press b). Gitxsan data provide evidence for the last approach, as in this language, future-orientation is overtly spelled out by a separate morpheme. This is shown in (17-20). (17) shows *dim* as a plain prospective aspect, with no co-occurring modal; it places the event time after the reference time (which in this case is the utterance time).

(17) **dim** ha'w=t James t'aahlakxw
PROSP go.home=DM James tomorrow
'James will go home tomorrow.'

(18) shows that *dim* is obligatorily present when the circumstantial possibility modal *da'ak(hl)xw* is used. This correlates with the future-oriented semantics of ability modals

[4] The question of effability also arises for languages which lack generalized quantifiers, such as the St'át'imcets case discussed in section 2 above. In St'át'imcets, if one wants to semantically convey a real distributive reading, as in 'The boys each read a book', one has to list all the boys by name.

(if I am able to do something, I have the potential to do that thing in the future). (19) similarly shows that *dim* is obligatory with the circumstantial necessity modal *sgi*.[5]

(18) *da'akhlxw*-i-s Henry *#(dim)* jam-t
CIRC.POSS-TRA-PN Henry *#(PROSP)* cook-3SG.II
'Henry is able to cook.' / 'Henry was able to cook.'

(19) *sgi* *#(dim)* ap ha'w-s Lisa
CIRC.NECESS *#(PROSP)* EMPH go.home-PN Lisa
'Lisa should/must go home.' / 'Lisa should have gone home.'

Finally, (20) shows that with an epistemic modal, *dim* is optional. When it is present, the reading is future-oriented (it might rain after the utterance time), and when it is absent, the reading is past- or present-oriented (it might have rained before now, or it might be raining as we speak). These are exactly the results predicted by the viewpoint-aspect analysis of a modal's futurity.

(20) yugw=*imaa*=hl *(dim)* wis
IMPF=*EPIS*=CN *(PROSP)* rain
'It might have rained.' / 'It might be raining.' / 'It might rain (in the future).'

The Gitxsan modal data not only shed light on the correct analysis of modal futurity, they provide evidence for underlying similarities across languages. At first glance, Gitxsan and English look different, since English does not combine modals with an overt prospective/future morpheme (it is ungrammatical to say ***Lisa must will go home***). And unlike in English, a Gitxsan epistemic possibility modal cannot be future-oriented by itself. Thus, (21) cannot be future-oriented (unlike its English word-for-word translation); *dim* is required for future-orientation, as in (22).

(21) yugw=*imaa*=hl wis
IMPF=*EPIS*=CN rain
'It might have rained.' / 'It might be raining.' / ≠ 'It might rain (in the future).'

(22) yugw=*imaa*=hl *dim* wis
IMPF=*EPIS*=CN *PROSP* rain
≠ 'It might have rained.' / ≠'It might be raining.' / 'It might rain (in the future).'

But if we assume that English has a silent prospective aspect whenever a modal is future-oriented – which is Kratzer's (2011) analysis, developed without prior knowledge of the Gitxsan facts – we see that Gitxsan is the overt spell-out of English, and that the languages are exactly parallel in their temporal interpretation possibilities for modals.

Another example of how formal research on non-European languages sheds light on more familiar languages involves the ambiguity of sentences like (23), from Condoravdi (2002). Condoravdi argues that (23) has an epistemic reading, as in (23a) (where the

[5] The seemingly past-tense translations which are possible in (20-21) should not confuse the reader. These interpretations have a past temporal perspective (the ability or obligation, was evaluated at some past time), but are still future-oriented (the potential or obligated event is situated after the temporal perspective. See Condoravdi (2002) for further explanation.

speaker believes at the utterance time that it is possible that he won the game in the past), and a counterfactual/metaphysical reading, as in (23b) (where it was possible at some past time t that he would have won after t).

(23) He *might have* won the game.
   a. He might have (already) won the game (# but he didn't).
   b. At that point he might still have won but he didn't in the end.

Several researchers have challenged Condoravdi's analysis of (23); relevant for current purposes is Hacquard's (2006) claim that *might* cannot have a counterfactual reading by itself. She argues (2006:95) that (23b) involves an epistemic *might* scoping over a special counterfactual modal. Laca (2008) also argues that in French and Spanish, there is no genuine epistemic-counterfactual ambiguity in this kind of sentence. However Gitxsan, which has different lexical items for epistemic and non-epistemic modality, distinguishes the two readings in exactly the way Condoravdi predicts:

(24) *Context: You were watching the Canucks but you fell asleep when it was tied. They might have won (you're not sure).*
   yugw=*imaa*=hl xsdaa-diit
   IMPF=*EPIS*=CN win-3PL.II
   'They might have won.' EPISTEMIC

(25) *Context: You were watching the Canucks and at one point in the first period they were up 2-1. At that point, they might have still won (but they didn't).*
   k'ay *da'akxw*-diit dim xsdaa-diit, ii ap nee=dii xsdaa-diit
   still *CIRC.POSS*-3PL.II PROSP win-3PL.II and EMPH NEG=CNTR win-3PLII
   'They still could have won, but they didn't win.' CIRCUMSTANTIAL

Gitxsan thus provides indirect cross-linguistic support for Condoravdi's claim that there is an epistemic/circumstantial ambiguity in the 'might have won the game' cases.

The conclusions from our case study on modality are that semantic variation seems to be restricted largely to choices about which elements of meaning are lexically distinguished. We have seen evidence against strong effability, but we have also seen that modal systems in Pacific Northwest languages display interesting similarities with those in Indo-European, and that the similarities are more striking once we analyze the languages with the appropriate level of abstractness. And modal systems in Pacific Northwest languages allow us to understand Indo-European languages better, by overtly encoding pieces of meaning which are only covert in the latter.

4.1.2 Non-Formal Typological Research Results

Typological research has uncovered a great deal of information about how modal notions are expressed across the world's languages (whether as verbs, affixes, etc.). It has also contributed useful descriptive information about the entire area of modality and mood, including which semantic categories are encoded cross-linguistically; see Palmer (2001) for comprehensive discussion, and de Haan (2006) for an overview. Typological research also presents important information about grammaticalization paths for modal elements (e.g., Bybee et al. 1994, van der Auwera & Plungian 1998). In this section I examine one

well-known typological work on modality, van der Auwera & Ammann (2008) (henceforth V&A). V&A's methodology is to consult a wide range of secondary sources, of which the vast majority are descriptive grammars. Generalizations are almost exclusively extracted from these descriptive secondary sources. I will show that this methodology leads to partially inaccurate results.

V&A's goal is to 'document to what extent languages have identical markers for situational and epistemic modality,' where 'situational' modality corresponds to circumstantial modality, including deontic and ability readings. Three types of language are distinguished, listed in (26).[6]

(26)

Category	Explanation	Languages
Red	The language has markers that can code both situational and epistemic modality, both for possibility and necessity	36
Pink	The language has markers that can code both situational and epistemic modality, but only for possibility or for necessity	66
White	The language has no markers that can code both situational and epistemic modality	105

English is in the Red category: it has overlap in the markers for (i.e., uses the same markers for) situational and epistemic modality, both for possibility and necessity. This is shown in (27) (cf. (9-10) above).

(27)
a. You *may* go home now. SITUATIONAL POSSIBILITY
b. John *may* have arrived. EPISTEMIC POSSIBILITY
c. You *must* go home now. SITUATIONAL NECESSITY
d. John *must* have arrived. EPISTEMIC NECESSITY (data from V&A)

St'át'imcets is in the White category; as we saw above, it has distinct lexical items for situational vs. epistemic modality (see data in (11-12)). The Pink category is languages which use the same modal for both situational and epistemic modality (like English does), but only for possibility modals, while for necessity modals, they have distinct elements for situational vs. epistemic. (Or vice versa: they have distinct situational vs. epistemic modals for possibility, and merge the two for necessity.) V&A categorize 207 languages into these three categories, and present the results in a world map which can be found at http://wals.info/feature/76A?tg_format=map&v1=cd00&v2= cf6f&v3=cfff.

There are several things wrong with this approach to investigating modality, and with the results obtained. The first problem is that the categories are vaguely defined. Take the definition of the Red category: 'The language has markers that can code both situational and epistemic modality.' Does this mean that *all* the modals can express both situational and epistemic modality? Or is it enough if just *one* of the modals can express both, while almost all of them lack overlap? The unclarity in this definition means that it is not clear where some languages should be classified, and this can lead to spurious generalizations.

A second issue is that the categories are too coarsely defined. V&A's three-way

[6] The colours assigned to each category are the colours of dot used by V&A in their language map.

categorization fails to capture significant differences among languages which have no overlap between situational and epistemic modality. There are at least three sub-types within V&A's White category. What we might call 'White-1' are languages which also have no overlap between necessity and possibility; an example of this type is Javanese. White-2 contains languages which have overlap between necessity and possibility only for epistemics (or only for situationals); an example of this type is Gitxsan. And White-3 languages have overlap between necessity and possibility for both situationals and epistemics; an example is St'át'imcets. The three systems are schematized in (28), with variable letters indicating the number of distinct lexical items used.

(28)

White-1	NECESS.	POSSIB.
SITUATIONAL	A	B
EPISTEMIC	C	D

White-2	NECESS.	POSSIB.
SITUATIONAL	A	B
EPISTEMIC	C	

White-3	NECESS.	POSSIB.
SITUATIONAL	A	
EPISTEMIC	B	

In V&A's categorization, all these three types of language are lumped into one category. This leads to both important distinctions and potential generalizations being missed. For example, impressionistically it seems as if languages of the White-2 type tend to neutralize the necessity/possibility distinction more often in the epistemic domain, than in the situational. This would be an interesting generalization if correct, but the three-way system set up by V&A does not allow the question to be asked.

The two issues raised so far have to do with the categories being investigated. There are also problems of implementation, which I argue arise as a result of V&A's methodological choices.

First, the available data are sometimes over-analyzed; more is read into them than is justified. For example, V&A classify Tigre (Semitic) as a White language, one having no overlap between situationals and epistemics; they cite Raz (1983:47,88,97). The information Raz actually gives consists of (i) a word translated as deontic 'can' (p. 47), (ii) some elements 'having the meaning 'perhaps, maybe, possibly', etc.' (for which one supporting example sentence is given), and (iii) some verbs with meanings like 'be unable', 'be necessary', ability 'can' (pp. 97-8). Having separate lexical items for situational 'can' and epistemic 'maybe' does make Tigre look like a no-overlap language. However, the conclusion is hasty, because if we had this much information about English, we might also (incorrectly) conclude 'no overlap'. English also has an unambiguously epistemic modal *maybe,* and a separate unambiguously situational modal *able.* There is just not enough evidence in Raz (1983) to classify Tigre one way or the other.[7] Another important issue is that even for the lexical items Raz does discuss, negative evidence is missing. There are no data showing whether the Tigre modals which are translated epistemically can have situational uses, and vice versa.

Data are also sometimes misanalysed. For example, V&A classify Koasati (Muskogean) as Pink, having overlap either in necessity or possibility. They cite Kimball

[7] This is not a criticism of Raz, who does not claim to provide comprehensive information about modality.

(1991:158-60,200); he gives separate forms translated as in (29) (1991:158-60,198-200):

(29) a. 'to be able to' SITUATIONAL POSSIBILITY
b. 'must / be obliged to' SITUATIONAL NECESSITY
c. 'must / would' SITUATIONAL NECESSITY
d. 'must be / might be' EPISTEMIC POSSIBILITY / NECESSITY

As far as we can tell based on translation (the only evidence Kimball provides), there is actually no overlap between the situational and epistemic forms; there seems to be no single form which allows both situational and epistemic interpretations. Instead, Koasati looks more like a Gitxsan-type system: there is no overlap between epistemic and situational modals in either necessity or possibility, but there is neutralization between necessity and possibility in the epistemic domain. Or, perhaps Koasati is a Javanese-type system where all cells are encoded separately, since there is also a potential separate epistemic possibility modal translated as 'perhaps; maybe'. Either way, Koasati does not seem to be a Pink language.

Another example of over- or mis-analyzed data involves Kiowa (Tanoan), which V&A classify, citing Watkins (1984:220-2), as having overlap for either necessity or possibility. What Watkins (1984) gives is (i) several epistemic particles on a scale of certainty: 'clearly', 'never, unlikely', 'probably, must(have)', 'was going to/might(have)', pure conjecture, and two particles translated as 'maybe/might'; (ii) a situational necessity modal 'must' ('emphatic obligation'). There is no information about situational possibility modals, and there is no evidence for any overlap between situational and epistemic modals, as all the forms given by Watkins are distinct. Based on the evidence provided by Watkins, Kiowa looks like most like a White-1 system (and certainly not a Pink one), but further investigation is clearly required.

More examples could be given, but it should be clear by now that there are systemic issues with the methodology of typological research based on examination of descriptive grammars. Typological work can only be as good as its primary sources. When it comes to semantic questions, descriptive grammars often give great clues about meaning. However, they almost always give translations and terminology rather than analysis. They also almost never give negative data. So there are only two choices for a typologist who relies solely on this kind of source: (i) admit that we know almost nothing, and produce a world map containing only very few coloured dots, or (ii) over-interpret the data, leading to potentially inaccurate claims.

In the final section I lay out what I believe the solution to these problems is.

5. A Plan for Uncovering Linguistic Diversity

In previous sections we have seen that typological studies on modals suffer from several problems, if they rely on sources which are not based on formal, in-depth study of the semantics of modality. The same will apply to any other area within semantics. The way to achieve accurate and informative semantic typology is to do in-depth formal research on individual languages first. The responsibility lies on formal linguists to do this kind of work, and on typologists to pay attention to the theoretical literature where it exists.

Once in-depth targeted research has been done on enough individual languages, then we can begin to ask interesting questions about the patterns we discover. For example,

some languages group all situational modals together (using the same lexical item for different situational meanings, such as ability and permission). A standard formal analysis of modality predicts we will find such lexical choices, because all situational modals share a core meaning, namely having a circumstantial modal base. Ceteris paribus, we would not expect a language to use one lexical item for epistemic and ability readings, and a different one for permission readings.

In the remainder of the paper I very briefly outline a methodology for how one can conduct cross-linguistic semantic research. These ideas are fairly standard within most formal semantic research, and are spelled out in more detail in works such as Matthewson (2004), von Fintel & Matthewson (2008), and Krifka (2011).

First, one uses the scientific method. One makes an initial hypothesis about some aspect of semantics in a language, conducts fieldwork targeted to the predictions made by the hypothesis, and revises the hypothesis based on the results. The second and third steps are repeated as often as necessary.

Next, one needs some fieldwork methodology. A simplified summary of this is as follows. First, set up an explicit discourse context for the utterance to be tested; then elicit either a translation into the object language of a sentence in the discourse context, or a judgment about the acceptability of an utterance in the discourse context. (The latter is called a Felicity Judgment Task by Matthewson in press a.) The data gathered include negative data; we need to know what is not possible as well as what is.

How does one choose the initial hypothesis? In the scientific method, there is a distinction between one's null hypothesis, and one's eventual hypothesis or analysis. However, it can still matter what one starts with. I have argued elsewhere for a 'null assumption of universality': if we know how something works in one language, the null hypothesis is that it will work the same in the next language. Universality is the strongest null hypothesis, and it is empirically testable. Importantly, having a null assumption of universality does not mean that we are unable to detect diversity. Since we test our null hypothesis, we will detect diversity whenever we find that the data do not match it.

At this point we can return again to E&L, who are suspicious of the universalist approach advocated here and adopted by many formal linguists. E&L assert that there is a 'widespread misconception of language uniformity' which in part 'can be attributed simply to ethnocentrism' (E&L:430). I reject this claim on all possible levels. First, there is no widespread misconception of language uniformity among formal linguists. I showed in earlier sections of this paper that linguistic diversity is well-attested in formal research. Second, a null hypothesis of universality is not the same thing as expecting all languages to look the same. Understanding this point follows directly from a correct understanding of the scientific method.

Third, the ethnocentricism accusation is easily falsified, because it is not the case that formal research attempts to force 'exotic' languages into a mold set by European ones. On the contrary, analyses of Indo-European languages are often revised based on other languages (see e.g., Matthewson 2001, Bittner 2008, a.o.). And finally, a null hypothesis of universality enables us to avoid the opposite problem of over-exoticization. An extreme non-universalist position (cf. Gil 2001), which denies the expectation of similarity between languages, can lead to premature acceptance of exotic analyses – particularly if claims are based on the absence of evidence for a relevant phenomenon.

In summary, the debate about the nature of linguistic diversity, and its theoretical implications, must be based on accurate claims about linguistic diversity. At least in

semantics, linguistic diversity is accurately discovered only by in-depth, formal analyses of individual languages, involving primary fieldwork. After this work has taken place, we can and should do theoretically informed, empirically sophisticated typology.

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